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Correspondence

Recent outbreaks of hantavirus-a very lethal and zoonotic virus – An update and counteracting strategies

Dear Editor

Despite having been documented for over four decades, Hantaviruses are currently considered emerging viruses due to their increasing relevance as human pathogens. The paradoxical spread of Hantavirus during the global pandemic struggle against COVID-19 made headlines in news and threatened the continued existence of the human species. Hantavirus is more serious and lethal than the SARS-CoV-2 virus since it has a greater mortality rate (50%) than the latter. Increasing numbers of hantavirus illnesses and cases of human-to-human transmission in recent years have posed a very worrying situation[1]. The present article highlights some of the recent outbreaks of Hantavirus infection in humans, importance of this very lethal virus, and counteracting strategies to tackle its spread.

Hantavirus is an emerging and lethal viral zoonoses, that spreads mainly by rodents. The etiological agent responsible for the disease belongs to the Bunyaviridae family and *Hantavirus* genus. It takes its name from the Hantan river in South Korea, where it was originally discovered in 1978[2].

Hantaviruses in the American states are known as "New World" Hantaviruses and these predispose to Hantavirus pulmonary syndrome (HPS). Other Hantaviruses called as "Old World" Hantaviruses cause hemorrhagic fever with renal syndrome (HFRS), mostly in Europe and Asia. Transmission occurs primarily via aerosolized virus that is shed in urine, feces, and saliva of the rodents, and rarely via bite from an infected rodent, such as the deer mouse[2]. There is a larger risk of hantavirus infection for farmers, street cleaners, and other manual laborers who are exposed to large amounts of virus contaminated dust, as well as for people who live in rural areas[3].

With the changing weather, inhabitants start cleaning their cabins or outdoor buildings which are usually infested with a variety of rodents, increasing the risk of exposure to hantaviruses. Early symptoms of this viral disease include fever, generalized body and muscle ache, fatigue, headache, dizziness, chills, nausea, vomiting and diarrhea. HPS severely damages lung parenchyma causing pneumonia, severe respiratory failure and cardiogenic shock. In due course, symptoms worsen and hospitalization rates are quite high in Hantavirus infection. The pathophysiology of Hantavirus is somewhat variable and is influenced by both the genotypes of human populations and the strains of the viruses themselves. Clinical symptoms or the severity of sickness caused by Hantavirus infection ranges from quite minor to life-threatening, depending on the individual's genetics, lifestyle, and other factors [4–6].

Hantavirus disease surveillance in the United States began in 1993 during an outbreak of severe respiratory illness in the four corners region where, Colorado, New Mexico, Arizona and Utah meet. HPS became a notifiable disease in 1995 and is now reported through the Nationally Notifiable Disease Surveillance System (NNDSS) since the year 1995[7]. In the year 2020, 833 cases of hantavirus infection had been reported, with 35% mortality rate in the US [8].

In April 2022, a 57-year-old man died with proven Hantavirus infection. The control actions began after receipt of notification from the Ministry of Health in the City of Buenos Aires. The Directorate of the Esquel Health Program reported a new case of Hantavirus, with a possible source of infection in the Andean region of Chubut province. An epidemiological link was established as the patient had stayed in the forest. However, no human contacts were observed to have acquired infection [9].

In Argentina, South America, on 14 July 2022, the National Ministry of Health stated that an 8-year-old girl has died of a Hantavirus infection in Chubut province. The child presented with severe abdominal pain, vomiting, and fever. Patient was hospitalized in the Zone Hospital in Esquel, where her health condition deteriorated and subsequently succumbed to Hantavirus infection. The close contacts were investigated in a series of control measures. Including this index case in South America, 32 cases of Hantavirus infection were confirmed in Argentina so far in the current year. The cases were documented from the provinces of Buenos Aires, the City of Buenos Aires, Chubut, Entre Ríos, Jujuy, Salta, and Tucumán; wherein five people have died. The source of Hantavirus infection for the index case could not be specified [9].

The Hantavirus infection was most likely attributed to Andes virus, found in western Argentina in the long-tailed pygmy rice rat host, *Oligoryzomys longicaudatus*. Andes virus has been proved to be transmitted directly between people in close contact, but there was no indication that this was the route of transmission in the above cases [9].

In July 2022, a total 17 cases of Hantavirus infection were reported, out of which 12 had HPS in province of Los Santos, Panama [10]. On August 29, 2022, the North Dakota Department of Health (NDDoH) had reported a pediatrics confirmed case of HPS in an individual in eastern North Dakota. After hospitalization, the patient recovered. This was the 1st case of a hantavirus infection in North Dakota this year (2022), previous two cases were reported in 2018 and 2016 [8].

In September 2022, 22 cases of Hantavirus were registered in Brazil, where wood mouse and rice mouse (Akodon spp. And Oligoryzomys spp.), found in farmlands, are known reservoirs of the virus. 10 succumbed to the serious infection in the outbreak which marked a high mortality rate. Los Santos, Panama documented a total of 29 Hantavirus cases in the months January to September 2022. The Department of Epidemiology notified 16 cases of Hantavirus Cardiopulmonary Syndrome and 13 cases of Hantavirus fever with no mortality, mainly from four regions: Tonosí district, Los Santos, Las Tabla, and Macaracas. Awareness programs were carried out in the communities to spread awareness regarding prevention from Hantavirus infection which focused on proper storage of food, maintaining cleanliness in the cabins,

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premises, and outdoors, sealing the places that can serve as rodents' burrows, etc. [11,12].

Currently, there is no curative antiviral medication for Hantavirus infections. It is still mostly a supportive nature of treatment that could work of care for patients with HFRS/HPS. After treating shock syndrome, patients should be moved to an emergency room or intensive care unit for further observation and care if an infection with Hantavirus is strongly suspected [1].

Diagnosing HPS in an individual with early symptoms such as fever, muscle aches, and fatigue can be difficult. However, history of potential rural rodent exposure aids in early diagnosis [13]. Hantavirus is a fatal infection, and despite optimal treatment, mortality rates are high. The best approach is the prevention which is possible by curtailing human-rodent contact with pest control in the living areas. Adequate ventilation of the living areas and allowing natural light for neutralization of the virus by ultraviolet radiations can prevent the infection. While cleaning cabins or outdoor buildings, or while disposing dead rodents, adequate precautions should be followed to prevent Hantavirus infection [14].

The environmental factors, cellular and viral dynamics in Hantavirus transmission from natural reservoirs to humans, and the virology in humans are all poorly understood in relation to hantavirus-related pandemics and syndromes. Setting up scientific collaboration, adequate funding supports, and encouraging health ministries and research institutes to come up to tackle this deadly viral pathogen would be commendable efforts toward building an understanding of this virus, and this virus should be at the top of the list of priorities for future study [4,15]. It takes more time to find novel therapeutic compounds like vaccines than it does to find new medications. Because of this, the latest advancements in artificial intelligence technology should help speed up the process of developing new impending drugs against Hantavirus. Finally, researchers should be provided with a data-sharing platform where they may freely exchange and disseminate relevant information, including data on genomes, proteomics, host-factors, and epigenetics, in order to foster scientific collaboration in the fight against Hantaviruses.

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Ranjit Sah.

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